

Just a Theory?

Background

Evidence of the deficiencies of existing transportation technologies is everywhere. Limited and increasingly expensive fuel supplies, noise and air pollution, and congested roads and highways are all indications that the existing methods of moving people and goods are less than ideal.

In response, more sustainable, environmentally responsible transportation methods are slowly emerging. Lightweight, low-drag body designs are commonplace. Computerization has improved the efficiency of gasoline engines and has led to the development of “hybrid” vehicles with both gasoline and electric engines. Vehicles powered by fuel cells and improved rechargeable batteries are in limited production. The space shuttle provides a far more efficient method of placing payloads in orbit than do single-use rockets.

Improved transportation technologies are too important to be left to lucky guesses or inspired tinkering. Research projects that apply basic scientific principles to guide and evaluate the development of new vehicles and their components are critically needed. Far from being “just theory,” physics principles related to momentum and energy conversion and conservation are key to developing the environmentally friendly, sustainable technologies of the future.



Hybrid cars combine power-generating technologies.



This is a recumbent or “reclining” bicycle.



Scooters offer a transportation alternative.

Challenge

Research the information and prepare a presentation that illustrates how the scientific theories and principles studied in this unit can be used to develop environmentally responsible transportation alternatives. The presentation must include aspects of your study of momentum, energy, and energy transformations. The presentation is to be designed to provide an intelligent adult audience of non-scientists with an understanding of how scientific theories impact everyday life.

Project Criteria

- A. As a class, develop clear, specific criteria for the presentation. Decide on acceptable methods of presentation, sourcing of information, time limits, and time lines for the project.
- B. In small groups, brainstorm examples of transportation technologies and related scientific principles. The examples can be very specific, such as a particular type of fuel cell, or quite general, such as an innovative bicycle frame design. Select topics so that your completed presentation will include information that you studied in all three chapters of the unit.

Action Plan

1. Decide on a theme for your presentation, so that each of your examples contributes to the development of your overall thesis.
2. Prepare a one- or two-page background outline to summarize your research, including properly referenced sources.
3. Develop a questionnaire, quiz, or rating scale for your audience so that you can gather feedback on your presentation.
4. Develop and present your project.
5. Prepare a written evaluation of your project that includes a summary of audience feedback and ideas for improving the presentation.

ASSESSMENT

After you complete this project

- **assess the clarity of your background summaries about each topic. Can others read your report and formulate specific questions about the topic?**
- **assess the effectiveness of your argument and examples. How well did it persuade audience members of the need for responsible choices of transportation technology and the value of studying basic scientific principles?**
- **assess the impact of your group's presentation as a whole. How well were you able to link the separate examples into a unified, coherent presentation?**

Evaluate

1. What information sources did your group find most useful in this project? How did you ensure that your presentation was free of plagiarism?
2. To what extent has working on this project increased your awareness of alternatives for responsible, sustainable transportation technologies? Explain how your transportation choices in everyday life model these values.
3. Is providing information enough to change people's behaviour? What else can be done so that manufacturers and consumers are encouraged to make responsible choices regarding transportation technology?
4. Suppose a friend questioned the value of studying basic scientific principles by saying, "They are just a bunch of generalizations and mathematical tricks. We need to concentrate on practical ways of solving real problems"? What examples from this project would you use to demonstrate the importance of studying scientific theory?